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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/611,955

07/06/2000

Cyprian Emeka Uzoh

F19-97-205B

6678

32074

7590

11/29/2005

INTERNATIONAL BUSINESS MACHINES CORPORATION

DEPT. 18G

BLDG. 300-482

2070 ROUTE 52

HOPEWELL JUNCTION, NY 12533

EXAMINER

VU, HUNG K

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 11/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

09/611,955



*EK*  
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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
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EXAMINER
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ART UNIT	PAPER
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8262005

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

See attachment.

<b>Office Action Summary</b>	<b>Application No.</b> 09/611,955	<b>Applicant(s)</b> UZOH ET AL.	
	<b>Examiner</b> Hung Vu	<b>Art Unit</b> 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 01 June 2005.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 25-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 25-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

In view of the Petition filed on 06/01/05, PROSECUTION IS HEREBY REOPENED.

New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 25-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitations (“a conductive barrier located over said insulating layer in said recess and over said at least one major surface” and “a conductive metal in said recess only”), as recited in claim 25, are not supported by the specification and/or drawings. Note that Figure 3 shows the

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conductive barrier (4) located over the insulating layer (3) in recess and over at least one major surface, but does not show the conductive metal (8) is in recess only. Figure 4, on the other hand, shows the conductive metal (8) in recess only and the conductive barrier (4) located over the insulating layer (3) in recess, but does not show the conductive barrier (4) located over at least one major surface. Also note that Figure 3 is an intermediate structure, while Figure 4 is a final structure. Therefore, none of the claims read on a single disclosed embodiment.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 25 and 28 – 32, insofar as in compliance with 35 USC 112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain (PN 5,821,168, of record) in view of Shibata (PN 4,577,395).

Jain discloses, as shown in Figure 10, a semiconductor structure comprising:

a substrate (26,54);

recess (72) located in at least one major surface of the substrate;

electrical insulating layer (56) located over the at least one major surface and in the recesses;

a conductive barrier (TiN disclosed in Col. 5, lines 38-43) located over the insulating layer in the recess;

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a seed layer (60) located over the conductive barrier within the recess only;

a conductive metal (62) in the recess only (see Figure 9). Note that at the final structure, the seed layer and the conductive metal layer (74) is in recess only.

Jain does not disclose the structure is formed in a semiconductor substrate. However, Shibata discloses a formation of a structure in a semiconductor substrate (10). Note Figures 1G, 3G, 5G, 6G and 7G of Shibata. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the structure of Jain in the semiconductor substrate, such as taught by Shibata in order to increase the packing density with the formation of a plurality of structures.

Note that the term “plating” is method recitation in a device claimed. “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Regarding claim 28, Jain and Shibata disclose the seed layer is copper (Col. 4, line 14).

Regarding claim 29, the term “sputtered” is method recitation in a device claimed. “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its

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method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Regarding claim 30, Jain and Shibata disclose the copper is approximately 50 – 150 Å thick (within the range of about 100 to about 2000 Å) (Col. 4, lines 14-20).

Regarding claim 31, Jain and Shibata disclose the conductive metal is copper (Col. 4, lines 28-29).

Regarding claim 32, Jain and Shibata disclose the conductive metal is about 6000 Å to 15,000 Å thick (within the range of 4000 Å to 30,000 Å) (Col. 4, lines 28-29).

3. Claims 26 and 27, insofar as in compliance with 35 USC 112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain (PN 5,821,168, of record) in view of Shibata (PN 4,577,395) and further in view of Maekawa (PN 6,329,284).

Regarding claim 26, Jain and Shibata disclose the claimed invention including the semiconductor structure as explained in the rejection above. Jain and Shibata further disclose the formation of the barrier layer. Jain and Shibata do not disclose the barrier layer comprises a layer of tantalum nitride adjacent the insulating layer and a layer of tantalum above the tantalum nitride layer. However, Maekawa discloses a semiconductor structure having a barrier layer (5) comprises a layer of tantalum nitride adjacent an insulating layer (3) and a layer of tantalum above the

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tantalum nitride layer. Note Figures 7-10 and Col. 5, lines 44-58 of Maekawa. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the barrier of Jain and Shibata comprising a tantalum nitride layer and a tantalum layer above the tantalum nitride layer, such as taught by Maekawa in order to provide a better adhesion between the conductive metal and the insulation layer.

Regarding claim 27, Jain, Shibata and Maekawa disclose the tantalum nitride layer is about 15 to about 500 Å thick and the tantalum layer is about 500 to about 5000 Å thick (Col. 5, lines 44-58).

#### ***Response to Arguments***

4. Applicant's arguments with respect to claim 25 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Conclusion***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (571) 272-1666. The examiner can normally be reached on Tuesday-Friday 6:00-4:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's acting supervisor, Steven Loke can be reached on (571) 272-1657. The Central Fax Number for the organization where this application or proceeding is assigned is (571) 273-8300.



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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

September 15, 2005

A handwritten signature in black ink, appearing to read 'Eddie Lee', is positioned above the printed name and title.

**EDDIE LEE**  
**SUPERVISORY PATENT EXAMINER**  
**TECHNOLOGY CENTER 2800**